

YELLOW FEVER

SUMMERS.

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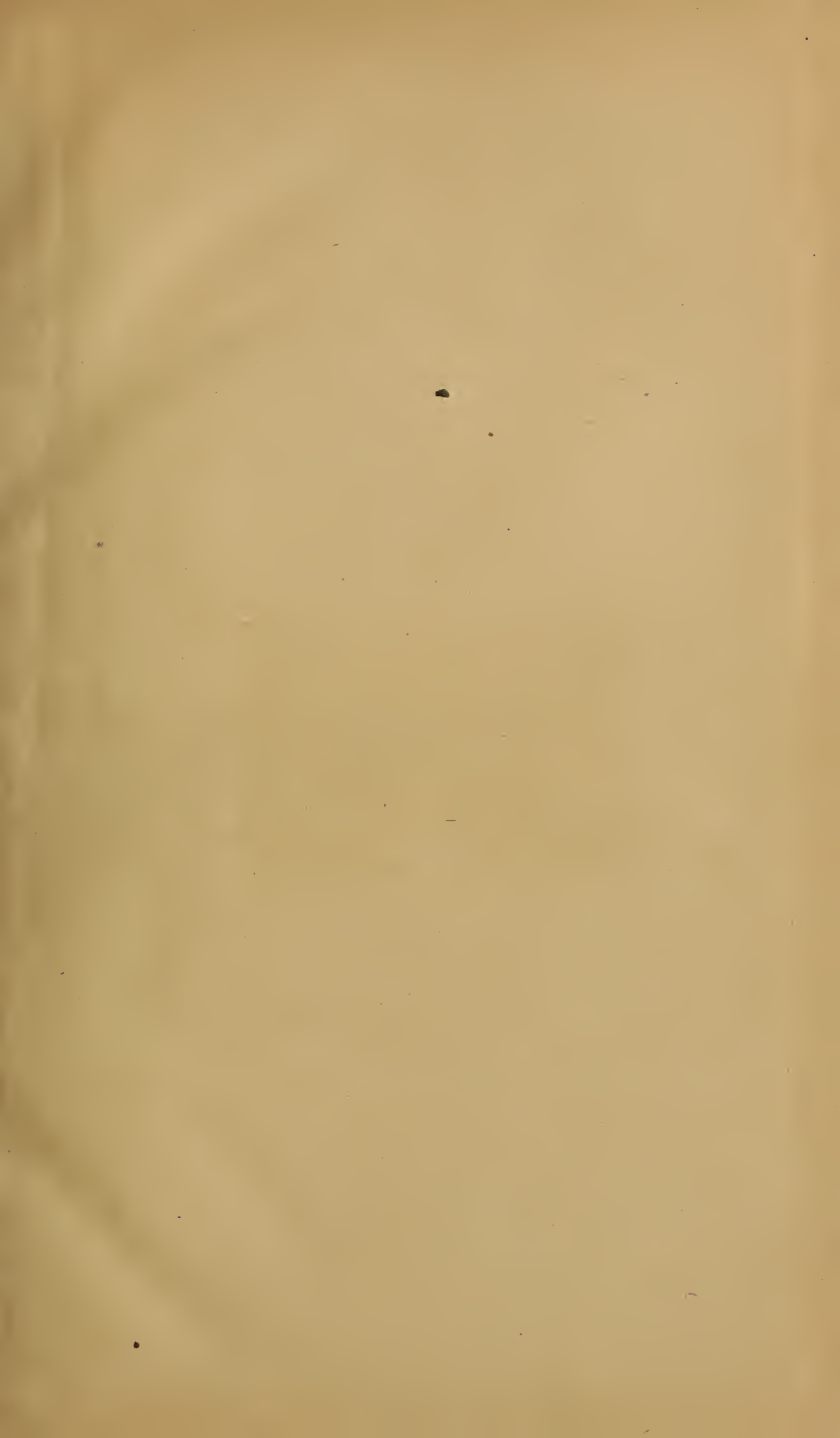
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YELLOW FEVER,

BY

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Vanderbilt University.*

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1879.

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TO THE MEMORY OF

THOMAS WILLIAMS MENEES, M.D.,

*Associate Demonstrator of Anatomy in the Vanderbilt University, and University
of Nashville ;*

MARTIN CLARK BLACKMAN, M.D.,

AND

ORLANDO DUFF BARTHOLOMEW, M.D.,

My former Students and Co-laborers,

WHO FELL IN THE GREAT EPIDEMIC OF 1878,

THESE RECORDS ARE TENDERLY DEDICATED.

PREFACE.

IT is with a considerable degree of diffidence that I offer to the Profession a work upon a subject of such momentous consequences as Yellow Fever. And yet, I cannot but feel it my duty to set forth, as best I can, the experience which I so richly enjoyed during the Epidemic of 1878.

I have endeavored to do this plainly, concisely, honestly, and I trust, humbly, for the consideration of those of my brethren whose lines may fall in the places of the pestilence.

T. O. SUMMERS.

NASHVILLE, *January 1, 1879.*



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YELLOW FEVER.

CHAPTER I.

ETIOLOGY.

THE disease which forms the subject of this treatise is the most formidable malady known to warm latitudes. It has received many names from the prominence given by authors and observers to the various phenomena of the disease. CULLEN, I believe, it was, who denominated it *Typhus Icterodes*. It is the disease of Siam, the Mediterranean fever, the malignant bilious fever of America, the sailor's fever, and the *fièvre jaune* of the French writers. Its most familiar application, however, is *Yellow Fever*, from the yellow tinge which is assumed by the skin during the progress of the disease.

Its natural home is in hot latitudes, along the coast of the Atlantic ocean, the Gulf of Mexico, and the great arteries of travel which flow into them. Along the Mediterranean it has raged, and has occurred in the West Indies more in the endemic, however, than the epidemic form. Of later years, it has been extending the limits of its prevalence into the inland towns of the Southern States lying in the track of travel and within the range of exposure to its infection. That it is confined to low, flat regions has been, by the late fearful epidemic, which has so devastated our Southern country, for-

ever set aside. That it depends for its existence upon the neglect of sanitary measures has been alike demonstrated to be utterly unfounded in fact, and the vaunting boasts of local boards of health who, because living in places not reached by the infection, lay the flattering unction to their souls that they have by any steps taken by them prevented its prevalence, must seem highly amusing to those who have seen its fearful ravages in places remarkable for their natural cleanliness and for their strict hygienic regulations.

The town of Holly Springs, Miss., is a standing rebuke to all such vain assumptions. Nor are we to suppose that barometric or thermometric conditions of the atmosphere alone determine the possibility of its development. The barometer and the thermometer may, and often do, stand at the same point, at the same time, in an infected and a non-infected place? We may go further than even this, and unhesitatingly declare that the quantity of moisture in the atmosphere at a given temperature cannot alone determine the propagation of Yellow Fever, or the elaboration of the morbid element upon which the disease depends.

What, then, are the conditions of its development? From patient and careful analysis of the atmospheric relations in those places where the disease has prevailed, as compared with those places of the same latitude where it has not, I am well assured, that by the use of the hygrometer we shall in time be able accurately to determine during any one season whether or not any given place enjoys an immunity from Yellow Fever.

The condition of the air, as regards moisture, involves two distinct elements: (1.) The amount of vapor present in the air; and (2.) The ratio of this to the amount which would saturate the air at the actual temperature. Our sensations of dryness and moisture chiefly depend

upon the second of these elements, and it is this which we denote by the term *humidity*; or, as it is sometimes called, *relative humidity*. The air is said to be dry when its humidity is below the average. This is usually expressed as a percentage; for example, if the weight of the vapor present is seven-tenths of that required for saturation, the humidity is said to be 70°. To illustrate this practically—the air in a room heated by a hot stove contains as much vapor, weight for weight, as the open air outside, but it is drier because its capacity for vapor is greater. In like manner the air is drier at noon than at midnight, though the amount of vapor present is about the same; and it is for the most part drier in summer than in winter, though the amount of vapor present is much greater. Now the instrument furnishing a precise measurement of the state of the air as regards moisture, is called an *hygrometer*. The *dew point*, as it is called, is that point at which the density of the vapor in the air becomes equal to the maximum density corresponding to the temperature. It is in this state that moisture can be utilized in the elaboration of germ life, and the temperature at which the density is greatest without condensation of the vapor, constitutes the *dew point*, which it will thus be readily seen must vary at different places. Now, even at the same temperature, and with the same amount of moisture in the air, there may be other conditions—such as electric currents, for example, which will cause a more rapid condensation of moisture at one place than another, and that place, according to my observations, during the summer of 1878, which, at the temperature necessary to elaborate a germ, showed the most rapid condensation of moisture, was, to that extent, more favorable to the introduction and propagation of Yellow Fever. I feel positively assured that while these investigations upon my part, thus far, have been

purely relative, the day is not far distant when we shall be able to determine the advance of Yellow Fever with the same accuracy that we now predict the movement of a storm wave. Furthermore, I have not the slightest doubt that the external conditions for the development of Yellow Fever may be found in the atmosphere alone ; nor do I believe that any amount of hygienic regulations can do more than indirectly modify the propagation of the disease by placing the subjects of infection upon a more healthful basis from which resistance to its influence may be more successfully offered. I should be far from discouraging sanitary measures, or throwing any obstacle in the way of the further development of that spirit of sanitary reform which has lately been inaugurated with such commendable enthusiasm ; yet I cannot but accept the fact, as it is forced upon us, that this terrible scourge is one of the powers of the air, and cannot be resisted except upon those general physiological principles which lie at the basis of all medical science.

What I have said above applies only to the external conditions favorable to the reception of the disease in various localities. It now remains to set forth its own inherent conditions of development as relate to the organism in which its phenomena are elaborated.

Yellow Fever is a Zymotic, or fermentative disease, and as all fermentation is set up by small organisms, so do all the manifestations of the disease in the human system depend upon the deposit within the blood of living organisms, which in their growth and development produce the morbid changes which characterize the course of the malady. I have never been able to establish the existence of a specific Yellow Fever germ. All that can be discovered to establish the specific germ nature of the disease is gathered from the presence of microzymes in the blood. These are not, however, of a specific

character. We encounter Bacteria, Vibriones, Torulæ, Monads, but never a germ which specifically determines the characteristics of the fever. All of the phenomena, however, which are manifested in the disease may be accounted for, without recourse to the hypothesis of a specific germ.

It is, I think, safe to assert that without a malarial basis of operation, Yellow Fever is never developed in any locality. It is a remarkable fact that at the beginning of every epidemic there are always conflicting opinions concerning the specific nature of the prevailing disease. It has been the history of every epidemic that malarial influences have been for some time prevalent, and that gradually by a process of enucleation, as it were, the disease assumes the epidemic form, after lopping off one symptom here and taking on another there, until the specific nature of the disease becomes permanently established.

It is a well known fact that the atmosphere is at all times charged with germs, but they do not become infectious unless the relations of the heat and moisture in the air sustain a favorable relation to the sporulation, or fructification of the germ. They are always thrown off from animal organisms in a matured condition, and unless they meet the necessary conditions for reproduction in the air, they die without throwing off a single spore. These conditions are found in a malarial atmosphere. For a long time the ordinary *malarial fever* prevails. This depends for its development upon heat and moisture alone—the action of the sun's rays upon moisture lying just beneath a thin stratum of earth, as has been suggested by Prof. W. K. Bowling, of Nashville, requiring no decomposition of vegetable matter whatever to develop it, since some of the worst malarial sections are those which have been remarkable for scanty vegetation.

And now the atmosphere, just at this point of malarial development, sustains to germs deposited within it in a matured condition—a fructifying relation.

Now, it is only when the germ begins to sporulate, or in other words, to give off an infant germ, that infection can result. It is only in the passage of the spore through its stages of development up to the matured germ that fermentation can result. Indeed, this it is which, by a peculiar catalytic action, as yet inexplicable upon any known principles of chemical philosophy, causes fermentation to take place in those fluids where the spore can receive its proper pabulum for development into the matured germ. This it assimilates at the expense of morbid changes wrought thereby in the blood in which it had been deposited.

This opens up to us the question, Is Yellow Fever contagious? Most assuredly not. The exuviae from the body of a patient are charged with matured germs which without a proper nidus for their sporulation would be perfectly harmless. Just as a grain of wheat might remain upon a block of marble for many years without germinating, and when removed to proper conditions of soil, moisture, and heat, would begin at once to sprout, so does this matured germ when thrown off from the body float harmless in the air until the conditions are rendered favorable for its sporulation, the little spore or infant germ being the infecting agent. Thus it is readily seen that infecting agents are developed outside of organisms, which they ultimately infect. Not so with contagion, which is developed in and about the affected organization. It is not then, as has been carelessly asserted, a mere difference between tweedledum and tweedledee. There is a very wide and significant difference between contagion and infection. Contagion depends not for its development upon atmospheric condi-

tions, but upon pathological conditions of the organism, while infection is developed *without* the organism by changes wrought in the germ under altered atmospheric conditions. In a non-infected atmosphere a healthy person may with impunity occupy the same bed with a yellow fever patient, whereas the exuviae from a small-pox patient will almost certainly develop the disease in any organism brought within the pale of contact.

The question may now very reasonably be asked, Why is it that if these germs exist in the air at all times we do not oftener find them exerting this peculiar morbid effect upon the organism? Why are epidemics not more frequent? The answer is simple. It is not often that we find the relations of heat and moisture so well balanced in the atmosphere of any one season as to develop this powerful malarial influence on which the growth of the germs seems to depend, and the intensification of which determines the moulding of the general symptoms into a specific type. The same conditions which appear to be necessary to the development of this high grade of malarial fever, which generally is the *avant courier* of the Specific Yellow Fever, are the conditions which seem to favor the sporulation of germs, and, consequently, their investment with the power of infection. And then, again, the conditions under which germs develop are different, and it is a natural result that their expression at maturity should likewise be different. Indeed, in these lower forms of organized life there is scarcely anything more than a mere skeleton of function, which external conditions invest with expressions as variable as the conditions themselves. Hence we are not reduced to the necessity of seeking out for each specific disease a specific germ, since the varying expressions of the organism and the changing conditions which surround it, are sufficient to account for the difference in Zymotic ex-

pression between the very same ferments, or catalytic agents.

These facts, together with the failure to establish the source of transmission of infecting germs from place to place, now bring me to assert, what I believe, if properly interpreted, has been the experience of the past, and which I am satisfied will be the experience of the future, that Yellow Fever is not necessarily an imported disease. If malaria is an indigenous disease, then is Yellow Fever also, since it requires only this intensified malarial influence to furnish the groundwork of its development. The history of the last epidemic has shown that many small isolated places were infected where there was no possible chance for the importation of the disease, without knowledge on the part of the inhabitants, and in the larger towns and cities this aggravated form of malarial fever always ushered in the Specific Yellow Fever by gliding gradually into it by such perfect shading of symptoms as to render it almost impossible to determine where the Yellow Fever began, certainly not, where the malarial ended; for this, indeed, was perpetuated by recurrent symptoms through the whole clinical history of the Specific Fever which followed in its wake. I know the strong indisposition—to a certain extent as commendable as it is natural—to recognize the existence of any fact that would in any way reflect upon the interests of the country in which it has fallen to our lot to live, and yet in this instance the fact demands our recognition. The issues have been so fearful that it is no longer expedient, nor possible indeed, to waive the investigation of their origin. We have already too long hugged the delusive phantom of quarantine, which is as inhuman as it is unscientific and impracticable. The time has come when we must recognize without further equivocation the existence of a

monster in our midst, and bend all our energies to throttle and destroy him. There is no time to lose. Yellow Fever is the curse of our land—yes, of *our* land, and the sooner we come to a recognition of the fact the sooner shall we be able to check the ravages of this most dreadful enemy to the social, political, and commercial interests of the South. As soon as the medical profession gave up the fruitless discussion of the local origin of cholera and proceeded at once upon the supposition of its indigenous nature to meet its attacks boldly and scientifically, just so soon did its power over communities begin to wane, until to-day in the cholera districts it has come to be considered as a dead letter in the roll of epidemics.

So will it be with Yellow Fever just so soon as we wake up to the fact that it is liable at any time during the heated seasons to break out among us, whenever the atmospheric conditions are favorable.

To what conclusions do we then come in regard to the origin and causes of Yellow Fever?

I. It is a Zymotic, or fermentative disease.

II. It does not depend upon a specific germ.

III. It is ushered in by a train of intensified malarial influences which gradually glide into the specific fever.

IV. It depends for its development upon atmospheric relations of heat and moisture.

V. It is not a contagious, but an infectious disease.

VI. It is a disease which may at any time spring up in Southern latitudes indigenously, whenever the atmospheric conditions are favorable.

CHAPTER II.

PATHOLOGY.

THE Pathology of Yellow Fever, as set forth by different authors, is strangely conflicting. The fact is, during an epidemic the demands are so great for medical services at the bedside, that it is seldom the case that dissections can be conducted systematically. I was fortunate enough, however, during the late epidemic of 1878, to have extended to me the privilege of regular dissections at the dead-house of the City Hospital in Memphis, by that most estimable medical gentleman, Dr. THORNTON, Marine Hospital Superintendent at that place.

During the whole course of the epidemic we enjoyed the best facilities for dissections and pathological investigations. Proceeding upon what we believe to have been established as a fact beyond the shadow of a doubt, that Yellow Fever depends for its phenomena upon the development of microzymes in the blood, we might reasonably expect to find here the beginning of pathological manifestations. During all stages of the disease we find the blood in an extraordinary state of fluidity. Even after death we find that the blood for several hours will flow freely from the severed vessels. To what may this condition be ascribed? The answer to this question will open up many of the most important factors in this disease. The first action of the spore upon the blood is to set up in its glycogenic elements a rapid fermentation. As a result of this, we have a large amount of

carbonic acid set free. This agent, it is well known, is one of the strongest solvents of albumen held in molecular suspension in any fluid, which is its normal condition in the blood. No suspended substance is subject to osmosis. It is for this reason that the albumen of the blood never passes out of the walls of the capillaries when it is in a normal state and relation to that fluid. But the very moment it passes from a state of molecular suspension to that of solution, it is at once subject to osmosis, and may pass through animal membranes, and be deposited in tissues to which blood vessels are distributed. Now, carbonic acid, one of the products of fermentation, is a solvent of albumen, and whenever it is set free in the blood it reduces the albumen from a state of molecular suspension to that of solution, thus rendering it subject to osmosis, and opening up a series of pathological changes which determine, I may say without exaggeration, the most prominent features of the disease, as we shall see when we come to consider its clinical history. Of all the organs in the abdominal cavity

THE SPLEEN

seems to be most affected. So prominent is this pathological feature, that it was difficult for me to convince many of my co-laborers that we had anything more than an ordinary malarial fever to deal with.

There is great hypertrophy. In four instances I found the spleen *eight inches long and five broad*. The parenchyma was greatly distended, the Malpighian bodies were swollen—many of them ruptured. The coloring matter of the bile was diffused through the whole organ. Its histological characteristics were scarcely recognizable. The splenic vein was engorged with a pulpified mass which was evidently made up of the degenerated struc-

ture of the organ. Albumen was largely deposited in the splenic substance in the form of stringy coagula. The hilum presented in almost every instance extensive structural lesions, which seem to have resulted from the interstitial deposit of albumen. The doughy consistency of the splenic substance resembles very much that condition of the organ known as *amyloid degeneration*. The difference in the character of the Yellow Fever spleen and that of the ordinary Intermittent Fever, leucæmia and pseudoleucæmia, appears to be, that in Yellow Fever, as in all acute infective diseases, the spleen is soft and swollen, with a thin and tense capsule—sometimes even ruptured—while in the last named diseases, of which the Intermittent Fever is the most prominent, the organ is indurated forming what many of our Southern pathologists have denominated the *ague-cake*. The color of the Yellow Fever spleen is of a yellowish tint, derived from the biliverdine, which is diffused through its substance.

The *pulp* projects from the cut substance, rendering it uneven, and hiding the follicles and trabeculæ more or less from view. The septa are thickened, and appear as distinct gray lines running in every direction, and forming a complete network, within which the splenic cells were contained, colored with biliverdine. Some of my associates, among whom was the lamented Dr. CHEVISS, of Savannah, suggested that these were hemorrhagic infarctions, and that the orange yellow pigmentation was due to hematoidine. This, however, was disproved by isolating the cells by means of needles, and examining them under a $\frac{1}{4}$ lens, when the distinct cellular character was brought out.

It is a remarkable fact that LAROCHE, whose investigations were mainly based upon the epidemic of 1853, in Philadelphia, lays so little stress upon the morbid

anatomy of the spleen in Yellow Fever. Indeed, after a few general remarks, he says simply, that "it is often found unchanged." This does not accord with my observations at all. In fact, I have never seen, except in one disease before—the Malarial Hematuria of the far South—such extensive structural derangement in the spleen. This suggests at once the well marked malarial features of the disease.

THE LIVER

is of a yellowish color, giving rise to the name by which it is well known to modern pathologists—the *boxwood liver*. It is almost entirely devoid of blood, but charged with biliverdine, which in certain lights gives the cut surface a slight greenish tinge. There is but little enlargement, if any, and, indeed, without any knowledge of the epidemic character of the disease, it might be often mistaken for the incipient stage of Yellow Atrophy of the Liver. There is no indication whatever of biliary secretion. I have often called attention to the fact that the liver of Yellow Fever patients and that of habitual drunkards were remarkably similar in their structural appearances. I have failed to remark anything very extraordinary concerning the liver in Yellow Fever beyond the simple cessation of function. This is the constant—the ever constant—pathological result of Yellow Fever.

There seem to be no permanent marks of inflammation, but a complete alteration in the condition of the liver. A section under the microscope shows indeed a congested appearance of the lobules and empty bile ducts, while the inter-lobular spaces around the inter-lobular plexuses are charged with the coloring matter of the bile.

The Portal Vein appears greatly congested. It is gen-

erally filled with a dark stringy mass, which, in the first ramifications of the vaginal branches, may be seen engorging the whole capacity of the vessels. There seems to be in almost all cases an absorption of fatty detritus, just as is seen in Yellow Atrophy of the Liver. It resembles that produced by phosphorus poisoning; but instead of being diminished it is increased in size; and, indeed, in this condition it has been known to pathologists under the name of *Yellow Hypertrophy*. A varying number of punctate hemorrhages are seen, especially in the connective tissue. Under microscopic examination the yellow portions are seen to contain liver cells, which are filled with a large quantity of biliary coloring matter, either diffused, granular, or crystalline.

Taken as a whole, however, there seems to be present, even in the most aggravated cases of the disease, but little in the morbid anatomy of the liver to account for the formidable hepatic complications which attend the whole course of the disease. I am thoroughly satisfied that these are of a *negative character*. *The key seems to be turned upon all secretion in Yellow Fever!* In the very onset of the disease there seems to steal over everything the paralysis of function, through the morbid changes in the nervous centers, presiding over the secretory apparatus of the organism. The only traces whatever of the biliary secretion we find in the biliverdine and cholesterine—the excrementitious constituents of the fluid. These, like all other excretions, exist preformed in the blood, requiring no secretory apparatus to separate them, but simply passing by osmotic action through the walls of the blood vessels. So, also, with the perspiration, which is a pure excretion, requiring nothing but filtration to eliminate it from the blood. The urine would also flow freely, were it not for

the fact that there is, as we shall hereafter see, a mechanical obstruction to its osmosis.

THE KIDNEYS

are hypertrophied, charged with biliverdine, and in some instances ruptured in the pyramidal structure. The pyramids of Ferrein are less subject to changes of color, but sometimes are increased in width, and become the seat of a grayish opacity or a yellow discoloration in the form of narrow and delicate lines. The yellowish-green discoloration is more marked in the medullary pyramids and their papillæ.

The bilirubine infarctions occur in Yellow Fever just as in the new-born; and I have never seen in any other pathological condition the rhombic tablets of fine needles, often arranged in arborescent or stellate groups and clumps, which occur in the interior of the tubules, in the epithelial lining, in the inter-tubular tissue, and especially in the vessels. I have closely studied these formations, and find them to exhibit the reaction of biliary coloring matter on the addition of liquor potassæ, washing away the excess of the fluid with water, and adding the proper strength of nitric acid, when there will result the successive rings of green, blue, violet, and red, extending from the periphery to the center. There seems to be no inflammatory condition of the kidney; in fact, nothing to indicate its inability to perform its normal functions, but simply the mechanical stoppage through the albuminous and bilirubine infarctions. Upon no other ground can we explain the suppression which forms the most alarming symptom in this terrible disease.

It is on this account that we fail to produce any action upon the kidneys by our ordinary diuretics. They are not at fault themselves—it is on account of these de-

posits in the tubules and the pelvis that the urine cannot pass. It is not a physiological, but a physical obstruction. The cause lies behind the filtering apparatus of the kidneys. It depends upon blood changes, which permit the deposit of material in the substance of the kidney, and preclude the possibility of the filtration of the urine, though it may be preformed already in the blood, and prepared for elimination from the organism. When we come to the treatment of this disease, we shall show what methods are necessary to correct this pathological condition.

The SUPRARENAL CAPSULES do not seem to be much affected outside of the discoloration produced by bilirubine and biliverdine exudation.

THE STOMACH

does not exhibit any traces of inflammation whatever after death. The mucous membrane is intact. I am at a loss to understand how so many pathologists make statements exactly opposite to this. In those cases which, from the onset of the disease, exhibit excessive tenderness about the stomach, I have found on *post mortem* examination not the slightest pathological change in the gastric walls. During the late epidemic, I have examined twenty-eight stomachs, selected from cases presenting the greatest divergence in their clinical history, and I have seen nothing to indicate any anatomical lesion whatever. Nor have I met with any evidences of congestion, which have been remarked by those authors whose investigations show no inflammatory condition of the mucous membrane. It is, therefore, with hesitation that I make known the results of my own autopsies, since they are, upon this point, so totally at variance with those of other observers, for whose accuracy of investigation I have the most profound respect.

No less eminent an author and investigator than DA COSTA, in giving the differentiæ between Yellow Fever and Bilious Remittent, says of the former :

“Autopsy shows inflammation or very great congestion of the stomach, and sometimes ulceration or softening.”

Of Bilious Remittent:

“Autopsy shows congestion of stomach ; more rarely a high degree of inflammation.”

Dr. HAYNE, of Charleston, as quoted by LAROCHE, says, that in all the dissections, with scarcely one exception, he found, on *post mortem* examination, changes in the gastric mucous membrane amply sufficient to explain so well marked a symptom as the tenderness in question, as also the others mentioned, *i. e.*, the softening with inflammation, and thickening and softening without inflammation, either with or without thickening.

I repeat that I can not understand this ; for to none of us who conducted these observations did these changes appear. There surely must have been some pronounced difference in the type of fever upon which the investigations were made.

I am, however, compelled, even in the face of high authority, to state simply the facts as I observed them ; and we shall see as we progress that my observations are borne out by the clinical history of the disease, as seen in the epidemic of 1878, upon which this treatise is based.

THE INTESTINES

in some cases show a very considerable degree of inflammatory action to have existed ; in others they exhibit no lesions of any sort. I have remarked in those patients whose attacks assumed a typhoid type a considerable ulceration of PEYER's patches. We found evidences of inflammation as far up as the opening of the ductus

communis choledochus into the duodenum. The *villi* appeared greatly congested. Brunner's glands were swollen by the injection of their excretory ducts with a greenish viscid fluid, which could be teased out of them under the microscope, but the nature of which I was not able to discover. The whole surface of the mucous membrane was bathed in biliverdine, which also floated all over the outer peritoneal covering, showing in the sunlight a beautiful opalescent play of colors. Along down the duodenum, and where there had been recent vomiting before death, extending up into the stomach, there was often to be found a greenish stringy substance, which could be traced through the bile duct to the *gall bladder*. This substance, when subjected to microscopical examination, showed broken down blood corpuscles and degenerated liver substance, colored with a dark green pigment. The gall bladder was often distended with this, and, on being opened, it would quiver to the touch like jelly. It resembled in every respect, physically, *meconium*. Never have I found the gall bladder to contain bile. When the stomach was charged with the *black vomit* there was always a continuous chain of this substance from the interior of the stomach through its pyloric orifice to the duodenum, and thence through the bile duct to the gall bladder. The stringy flocculi of the black vomit resembled the solid portion of this substance in every respect, and I believe them to be identical.

THE LUNGS

did not appear to be altered in structure. There is frequently an engorgement, with dark colored and altered blood at the posterior or lower portion. Sometimes there are black ecchymoses all over the surface of the lungs. The air passages are generally normal in appearance.

THE HEART.

The substance of the heart is generally more or less softened and flabby. The interior is colored with that greenish tinge which pervades the tissues of the body generally. The character of the blood contained in the cavities of the heart is of a dark grumous character. The albuminous concretions referred to by LAROCHE were not often found. Only in four cases were they observed. The aorta was deeply tinged at its origin with green, as also the orifices of the pulmonary veins.

THE BRAIN

presents several important pathological changes. The CEREBRUM is less affected than any other portion. After removing the *Centrum Ovale Minus*, the *Puncta Vasculosa* were found to be very much enlarged, and instead of the beautiful pink, there was this strangely pathognomonic greenish tinge which is found throughout the organism. The sinuses of the dura mater are all more or less engorged and charged with a superabundance of Cholesterine, which, on account of the cessation of the functions of the liver has remained in the general circulation. The MEDULLA OBLONGATA is softened in most cases, and the Pneumogastric Center is especially so. A section of this nerve just at its origin shows extensive cellular destruction, the result of acute and rapid inflammation. All the cerebral nerves appeared not only congested, but inflamed in most instances, and in many the inflammation had gone on to structural lesions. I am not, therefore, prepared to accept the conclusions of LAROCHE, which, certainly, from what follows, must have been drawn from widely different pathological conditions which most assuredly did not manifest themselves in the epidemic of 1878.

He says :

“ Whether the changes found in the spinal organs are to be referred to inflammation may very properly be doubted. More properly are they to be referred to mere congestion, which has but too often been mistaken for the former, and to the hemorrhagic tendency which, as we have seen, constitutes a main characteristic of the disease. If, indeed, the medulla or its membranes have presented unequivocal marks of the inflammatory process, such cases may reasonably be viewed as exceptional—the effect of an accidental complication—and not as forming an essential part of the disease. Nor is it less true that the unaltered condition of the parts in most, or at least in very many cases ; the fact of their redness, in some instances, is no indication of the prior existence of acute morbid action, and is often found after other and very dissimilar diseases ; added to the circumstance that the serous effusion described as discovered in many instances cannot be viewed as a proof of prior disease, since it is found in subjects who have died from the most opposite causes, lead to the conclusion, that so far as our information extends, we are not to look to the spinal organs for the seat of any morbid changes of importance, or peculiar to or characteristic of Yellow Fever.”

Now, this I cannot accept. We shall see when we come to the clinical history of the disease that it strikes at the cerebro-spinal system of nerves, just as malarial fever attacks the sympathetic, the ganglia of which in Yellow Fever were diseased in exact proportion to the malarial complications in the particular case. This is well sustained by the clinical results. It is a well known fact that quinine acts as a physiological antidote to malaria by its impression upon the cerebro-spinal system, thus restoring the balance of antagonism between this system and the ganglionic, which has been disturbed by

malaria. And now, as the Cerebro-Spinal System is under the influence of another poison, the quinine cannot have in the disease the ordinary antiperiodic effect. Hence the total failure to receive any benefit from its administration in the late epidemic, since the field of its therapeutic operation was already occupied by the Yellow Fever poison. It only aggravated the inflammatory symptoms of the Cerebro-Spinal System, while it exerted no influence whatever upon the Sympathetic, which can only be reached through the medium of the other system of nerves; and then the positive evidence of cerebral lesions which characterized this fever, the morbid indifference, the restless jactitation, ending often in delirium, left no room for doubt, even though the accuracy of our observations might be reasonably questioned. So far am I therefore, from accepting the conclusion of LA ROCHE, that I do not hesitate to assert my conviction that the Cerebro-Spinal System is the grand rallying point of all the pathological tendencies in this formidable disease, and I am satisfied that the experience of all my co-laborers will bear me out.

We shall have occasion again to call up this point in discussing the treatment of the disease.

THE SKIN.

The discoloration of the skin which has given a name to the disease varies with the stage of the fever, and likewise with the intensity of the symptoms. The pallor which forms one of the prodromic symptoms is soon succeeded by a rosy flush, which in its turn is followed by a yellowish tinge, deepening as the disease advances, remaining for a long time after recovery, and in case of death becoming so pronounced as to suggest to the mind of the ordinary observer the name by which at present the fever is almost universally designated. This discol-

oration, however, does not occur in all cases, and then, moreover, there are other diseases which are in no wise related to Yellow Fever in which the skin is just as much discolored. So that it is by no means pathognomonic of the fever. I have seen many cases in which there was not the slightest discoloration of the skin beyond the mere flush which is common to all fever. But while in Yellow Fever we do not always have this discoloration, there is a cutaneous change which takes place in most cases, which does not occur in any other disease, and that is the dusky violet-bluish color which the skin assumes. And even the succeeding yellow tinge which it takes on may be distinguished by the experienced eye from ordinary jaundice. It generally begins behind the ears along the course of the posterior auricular and occipital arteries. It then extends to the face and neck, and finally becomes generally diffused. After death the color deepens, and is rendered even more pronounced by the dark violet-colored splotches which are scattered over the whole body. In fact, there seems to be a deep modena base underlying the Chorium, which gives more of an orange tint to the yellow of this fever, thus distinguishing it from that of ordinary jaundice.

There seem to be no anatomical lesions in the structure of the skin. Indeed, as I have before intimated, it is a remarkable fact that there is but little, if any, structural lesion in the organs of excretion during an attack of Yellow Fever. The great pathological characteristic seems to be the locking of the secretions and the arrest of absorption, while at the same time there is an excessive migration of white blood corpuscles which, by a species of autophagism take up all the nutritive elements which were intended for the use of the organism. From the beginning to the end there is a retrograde metamorphosis of tissue. The tendency is ever downwards—the waste far outstripping the repair.

THE EXCRETA.

As I have before remarked, there seems to be but little if any disturbance of the excretions during the course of Yellow Fever. They are frequently blocked up, but are always to be found preformed in the blood by the normal physiological process.

THE URINE

is generally pale and charged with albumen. After standing a few hours it emits a foul sickening odor and readily ferments. Sometimes it is highly colored with biliverdine, but it is usual for this substance to be exuded into the substance of the tissues before reaching the urine. I append below the analysis of the urine in five typical cases of the disease. My facilities for making accurate quantitative analyses were not good, though sufficient for all practical purposes.

CASE No. I.

William B——, ætat. 37—full habit; no abnormal diathesis; general health good; ruddy complexion; temperate habits; type of the attack virulent from the beginning; nervous symptoms predominating; no black vomit; death on the sixth day after twenty-four hours suppression. Analysis made on the fourth day:

Water,	-	-	-	-	-	930.00
Urea,	-	-	-	-	-	32.00
Creatine and Creatinine,	-	-				2.00
Urates,	-	-	-	-	-	3.00
Mucus and Coloring Matter,	-	-				2.00
Chlorides,	-	-	-	-	-	6.00
Sulphates,	-	-	-	-	-	7.00
Albumen,	-	-	-	-	-	18.00
						<hr/>
						1000.00
Reaction Acid.	Spec. grav.,	-				1030

CASE No. 2.

Annie W——, ætat. 19—light frame; nervous temperament; fair complexion; delicate health; bad hygienic surroundings; no black vomit; temperature and pulse running high; no suppression; recovery slow. Analysis made on the eighth day :

Water,	-	-	-	-	-	935.00
Mucus and Coloring Matter,	-	-	-	-	-	4.00
Creatine and Creatinine,	-	-	-	-	-	2.00
Urea,	-	-	-	-	-	28.00
Urates,	-	-	-	-	-	5.00
Chlorides,	-	-	-	-	-	6.00
Sulphates,	-	-	-	-	-	5.00
Albumen,	-	-	-	-	-	15.00
						<hr/>
						1000.00
Reaction Acid.	Spec. grav.,	-	-	-	-	1026

CASE No. 3.

William C——, ætat. 14—spare build; uric acid diathesis; black vomit on the third day; death with suppression on the fourth day. Analysis made on the second day :

Water,	-	-	-	-	-	932.00
Mucus and Coloring Matter,	-	-	-	-	-	6.00
Creatine and Creatinine,	-	-	-	-	-	2.00
Urea,	-	-	-	-	-	30.00
Urates,	-	-	-	-	-	6.00
Chlorides,	-	-	-	-	-	4.00
Sulphates,	-	-	-	-	-	3.00
Phosphates,	-	-	-	-	-	2.00
Albumen,	-	-	-	-	-	15.00
						<hr/>
						1000.00
Reaction Acid.	Spec. grav.,	-	-	-	-	1020

This was the only case in which I detected the presence of phosphates, except where Phosphate of Ammonia or some preparation of Phosphoric Acid had been freely used in the treatment.

CASE No. 4.

Nathan M——, ætat. about 40—a strict vegetarian; gastric symptoms very pronounced from the beginning; black vomit; nerve lesions well marked; death:

Water,	. . . . .	938.00
Mucus and Coloring Matter,	. . . . .	2.00
Creatine and Creatinine,	. . . . .	1.00
Urea,	. . . . .	35.00
Albumen,	. . . . .	20.00
Urates,	. . . . .	1.00
Chlorides,	. . . . .	2.00
Sulphates,	. . . . .	1.00
		<hr/>
		1000.00

Reaction strongly acid. Sp. gr., 1019

CASE No. 5.

Henry H——, ætat. 26—slender frame; dissipated habits; lithiasis; suppression on third day, causing death. Analysis of last urine drawn:

Water,	. . . . .	928.00
Mucus and Coloring Matter,	. . . . .	10.00
Albumen,	. . . . .	18.00
Urea,	. . . . .	38.00
Urates,	. . . . .	6.00
Chlorides,	. . . . .	trace.
Sulphates,	. . . . .	trace.
		<hr/>
		1000.00

Reaction acid. Sp. gr., 1030

These were the only quantitative analyses made. I have not recorded the fractions, as the balances were not delicate enough to arrive at anything more than an approximative result. This, however, is sufficient to establish a basis upon which to draw conclusions in regard to the urinary pathology of this disease, which in most cases, I may say, was the immediate occasion of dissolution.

THE PERSPIRATORY GLANDS,

being excretory organs, as we would naturally expect, are active. There is an excessive amount of excretion, especially in the first stages of the disease. The excretion itself is charged with biliverdine, and imparts a yellow color to cloth when dried upon it. It has a peculiar odor, which I do not venture much in affirming to be pathognomonic of the disease. In years past, I have often heard old nurses in the South declare that they could smell a case of Yellow Fever as soon as they stepped into the room where a patient was lying. Upon personal investigation, I am satisfied that they are correct. I have tried to find some thing with which to compare it, but it is so positively *sui generis* that I have discovered as yet nothing which will impart any definite idea of the odor to one who has not observed it, but the odor of mash in a brewery more nearly resembles it than anything else. The amount of perspiration in this fever is remarkable. Oftentimes it is sufficient to saturate the covering. Most of the elimination of effete matters from the organism is carried on through the perspiratory system, and often it performs vicariously for several days the excretory functions of the kidneys. It seems as though nature in her efforts to sustain the organism against the destructive tendencies of this formidable disease relies

almost entirely upon the eliminative functions of the perspiratory glands.

Hence, as we might reasonably expect, the sweat of Yellow Fever contains much that does not really belong to this normal physiological excretion—much which, if not eliminated in some way, would by its toxic effects upon the organism render most certainly fatal the issue of the disease.

THE BLACK VOMIT.

Without any apparent structural lesion in the stomach, Yellow Fever has ever been known to be attended with a symptom which has stamped it with an individuality most certainly differentiating it from every other disease, and that is the ejection from the stomach of a peculiar matter ordinarily known as the BLACK VOMIT. So exclusive an attendant upon Yellow Fever is this alarming symptom, that the Spaniards have given to the disease the name *Vomito Prieto*, and HIPPOCRATES has described this fever under the name of *Black Disease*, showing what importance he ascribed to this peculiar, and, as generally regarded, specific symptom. But recent investigations have show that it is not of itself pathognomonic of Yellow Fever; for not only are there many cases in which it does not occur, but there are other diseases in which, under some circumstances, black matter is ejected from the stomach.

There are certain poisons which, introduced into the organism, produce ejections like that of black vomit. It has also been observed in acute peritonitis, puerperal fever, and the vomiting of pregnancy. In the Malarial Hematuria of the South it has been frequently met with, and cases of bilious and remittent fever have been reported as having been attended with the same character of ejections as that of black vomit in Yellow Fever.

This peculiar matter, however, belongs more to Yellow Fever than to any other disease ; and while it cannot be considered as a distinctively pathognomonic sign of this disease, it most certainly is one of the strongest diagnostic features in the whole course of the malady.

In all of my autopsies, I found more or less of this substance in the stomach or intestines. Its color is not a decided black. Under a strong light it has been likened to coffee grounds. It is made up of stringy flocculi, which sink to the bottom of the vessel, and when gathered together, form a viscid gelatinous mass, which sticks readily to any surface. The quantity of the black vomit contained in the stomach varies much. I have in several instances found the stomach immediately upon death largely distended with it ; in others, I have found little more than a teaspoonful. It appears to be continuous with the stringy contents of the gall bladder. Under the microscope it exhibits broken-down blood corpuscles generally, but they are not always constant constituents of this substance. The dark substance which gives name to the ejection, is simply degenerated biliverdine.

I have already remarked that the liver does not secrete at all, it only allows the cholestrine and biliverdine—the excrementitious matters of the bile—to filter through into the hepatic ducts. Mixed with the broken-down lobular substance of the liver, we have a gelatinous, stringy mass, which resists all proximate analysis from the disintegrated and heterogeneous nature of the material entering into its formation. Under the microscope it presents the appearance of defibrinated blood after the corpuscles have been macerated. It was formerly supposed that this peculiar substance exuded through the walls of the stomach, which by continued congestion of its mucous membrane could no longer retain its accum-

mulated and disorganized blood. But there are two facts which forbid such a conclusion. In the first place, we have seen that the stomach is not in a congested condition after death. I have had the opportunity in several instances of opening the cavity of the abdomen in five minutes after death, in persons dying from suppression, and nerve lesions just immediately before the black vomit should have been ejected. I have found the stomach distended with it, and yet not the slightest structural lesion in its walls, or, indeed, evidence of inflammation or congestion.

And then, secondly, the black vomit itself only contains disorganized blood as an accidental constituent. The fact that it gives the reaction for the excrementitious matters of the bile, and that it contains unmistakable evidences of broken-down lobular substances from the liver—point conclusively to the hepatic origin of the black vomit. The pyloric orifice of the stomach is really closed after the sympathetic system has been thoroughly under the toxic effects of the disease, so that there is no obstruction to the passage of the contents of the gall bladder, or of the hepatic ducts opening by the common bile duct, into the duodenum. Moreover, a section of the liver through the division of the portal vein, shows the accumulation of a large quantity of this same matter—the manifest result of structural disintegration, which is almost as readily taken up by the bile ducts as the bile itself. And then, too, this very disintegration of the liver substance extends to the hepatic ducts, and passes readily through them.

The theories in regard to the origin and nature of the black vomit are so numerous, that in a work like this, the scope is too limited to admit of even the statement of them. I therefore, confine myself to my own observations and conclusions. I feel well assured that there

is still very much to be discovered in this direction. And yet that the excrementitious matters of the bile form the main constituency of this ejection I do not think admits of doubt, for the reasons which I shall tersely recapitulate, as follows:

1. It cannot be the product of a morbid secretion of the inflamed vessels of the stomach, since the black vomit is seen to exist in great quantities where there is no evidence of gastric inflammation, or even congestion.

2. It cannot be vitiated bile, since it occurs when the liver is most inactive, when there is no secretion of bile whatever.

3. It cannot be altered blood, since the presence of blood, however altered, is always indicated by a reddish tint, which is not always observed in black vomit, and when found, is due to the hæmatemesis occurring very frequently in the last stages of Yellow Fever.

4. It must be of a biliary character, however, since it gives the reaction for the coloring matter of bile.

5. It is not a homogeneous fluid, and, therefore, cannot be a secretion.

6. The constant presence of degenerated lobular substance shows that its origin is outside of the stomach, in which organ no pathological change can be found to account for the existence within it of the ejection.

7. It can, therefore, be nothing more nor less than the excrementitious matters of bile, which exude when the liver is not secreting at all, mixed with broken-down liver substance, mucus, highly acid gastric juice, and altered blood, whenever the disease takes on the hæmorrhagic tendency.

The other points connected with the time and the mode of ejection will be discussed under the clinical history of the disease.

THE FÆCES.

The tendency of Yellow Fever is to constipation, and the discharges when brought about by aperients or cathartics, are peculiarly offensive. They are very acrid in character, and after the third day generally contain much of the same matter that is ejected from the stomach as black vomit. They readily ferment on standing, and emit a sour smell. Under the microscope they are seen to be fairly swarming with torulæ and bacteria. Hemorrhages are frequent, and in the epidemic of 1878, much more so than in any previous. The mucous membrane of the intestines is exfoliated, and passes off with the discharges, to a greater or less extent dependent upon the inflammatory nature of the disease. In all cases there are found large quantities of epithelial scales, which pass off often in complete rings.

THE BLADDER

is generally found shrivelled, and with thickened coats. There is very little, if any, indication of structural lesion in the mucous membrane, which is generally healthy. It is lined with mucus, colored heavily with biliverdine. During the late epidemic the bladder was generally found empty. Frequently, we found pure blood, and sometimes a fluid resembling black vomit, which, when mixed with urine, showed a discharge similiar in physical appearance and chemical reaction to that which characterize Hemorrhagic Malarial Fever.

THE PHYSICAL CONDITIONS

of the organism during an attack of Yellow Fever are very much altered.

THE HEAT

of the body is intense, the temperature running as high as 106° F., and in some instances as high as 110° . I can see no better way to account for this degree of heat than to regard it as due to the excessive amount of fermentation developed in the blood. The internal heat of the organism is very great. On opening a subject immediately after death the internal organs feel as though they had been dipped in boiling water, and the diffused fluids of the body by which they are surrounded are hot and steaming. Indeed, it seems as though it were impossible for any organ to perform its function in such a pyretic condition of the tissues. The system is literally burned out.

THE OSMOTIC CONDITION

of the organism is above the normal standard. Exudation is free, and the diffusion of fluids extensive. While this is true, as we have before remarked, there is little or no secretion going on in the glandular system. The blood gives up all excrementitious matter readily, but the glands do not take up the elements out of which to form their peculiar secretions, or if they do take them up, do not form the secretions, but remain engorged with the mass which it cannot work up to a physiological relation.

CHAPTER III.

CLINICAL HISTORY.

IN the description which I shall give in this Chapter of the Yellow Fever, at the bedside, I shall follow the order in which the symptoms arise, so as to give as vivid a picture of the disease as possible to one who has never observed a case.

I have found it utterly impossible accurately to divide the disease up into stages. The symptoms so often crowd in upon each other, overlap and interlace, that I do not believe it possible to make a classification of symptoms upon any such division into stages, as that adopted by COPELAND, LAROCHE, and others. I shall, therefore, confine myself strictly to the pathological order of the symptoms as manifested in the disease at the bedside.

The onset of the disease varies in different persons. In most instances it is ushered in by a chill. This, however, is not well marked, generally consisting of rigors down the back, and chilly sensations passing now and then by a wave-like movement through the system. It is not an ordinary malarial chill, since it never returns. It is in many instances a simple feeling of *malaise*, attended with stretchy sensations, which run through the body at intervals. Indeed, the condition, more than anything else, resembles that indicated by the prodromic symptoms of an ordinary chill. There is considerable anorexia, amounting sometimes to a loathing of food. There is generally headache, languor and lassitude—in

all better expressed by the one French word—*malaise*. It is usual for the patient to attribute these symptoms to general causes—such as overwork, exposure, or even ordinary malarial influences. They are rarely willing to admit that they are the subjects of the prevailing disease. The same delusive hopes that are so peculiarly characteristic of consumptive patients are indulged in, to even a greater extent, by the subjects of Yellow Fever. It is difficult to prevail upon them to go to bed, so positively do they generally resist the onset of this disease. After this sense of languor and lassitude there follows immediately—sometimes occurring simultaneously—pains in the back of the neck, in the whole spinal column, in the lumbar regions, and in the limbs, which increase towards evening, becoming very intense at night. The eyes are dull and injected, filled with water, and wandering restlessly from point to point. There is considerable moodiness and depression of spirits, and the patient soon becomes irritable and restless. This continues twelve hours or more. The febrile stage now comes on. The eye becomes restless, the countenance anxious, the tongue thickly coated, and the pulse bounding, compressible, gaseous, and frequent. The temperature of the body runs up rapidly. In most cases it reaches 104° Fahr., in many 106° , and in some even as high as 110° .

And now what is so very remarkable about this strange disease, the rise in the temperature is accompanied by the most profuse perspiration, of a very offensive odor, and staining the bedclothes when dried upon them. Here is the *point d'appui*—the first point of variation from ordinary malarial fever. In the last named fever there is first the cold stage, then the febrile stage, when the skin is dry, hot, and shrivelled; and after this the decided sweating stage, which ends the periodic phenomena developed by the poison. There is no blending,

but a well marked pathological pause, if I may so speak, between the different stages of a periodical expression of Malarial Fever. Not so with Yellow Fever, where the perspiration is often most profuse when the temperature of the body is highest, and with both of these the pains are often most intense.

The pulse runs very high. In the first twenty-four hours generally keeping along *pari passu* with the temperature. Of four hundred and eighty-two cases the highest record I find to be 128° in an adult, and 132° in a child of 4 years of age. In the accurate and beautifully arranged report of Dr. E. O. BROWN, Physician in charge of the Yellow Fever Hospital in Louisville, I find the highest range of the pulse to be 140° , in a female patient 19 years of age. This is the highest range I have ever seen authentically reported, and higher than I have ever observed myself. Under the finger it is very compressible and rolling, just as though air bubbles were chasing each other along the arterial current, giving rise to the term *gaseous pulse*, the appropriateness of which can only be appreciated by those who have felt the peculiar sensation imparted to the finger. Nor is this a mere *term of resemblance*; for the fermentation in the blood is now at its height, and the carbonic acid is *set free* to such an extent as in reality to fill the current with bubbles. The arterial walls are soft and flabby, with but little muscular tonicity, strongly paradoxical as this may seem. There is just sufficient muscular action in the arterial walls to keep up the rhythmical action with the rapid beat of the heart, and to carry on the impulse given to the seething blood at the fountain of the circulation, and the slightest pressure will check the current at once. Under the paralysing influence of the malarial poison with which the Specific Yellow Fever is complicated, the sympathetic system of

nerves have no antagonizing effect upon the circulatory apparatus, and the excitement of the Cerebro-Spinal System increases doubly the vascular congestion, just as though the sympathetic had been cut and the Cerebro-Spinal unduly stimulated. This phenomenon throws much light upon the pathology and treatment of the disease, as we shall see further on.

The anorexia which marks the onset of the disease in most cases continues until the third day, the patient rarely suggesting a desire to eat anything. The thirst is, however, intense, and not easily gratified. The respiration is quickened and not as deep as the normal.

The bowels are constipated with rare exceptions. The feces are colored with bile, and are seldom altered in their appearance. They yield, however, a very offensive odor, and when allowed to stand in tepid water will soon begin to ferment. A solution of them shows numerous microzymes, of the same character as observed in the blood and urine.

The urine is scanty, and in many instances suppression takes place in the very outset of the disease. There are cases which die very soon, and show at *post mortem* examination extensive albuminous infarction of the kidney. As before remarked, the suppression is mechanical and due to the obstruction of the tubes of the kidney. Uremia rapidly sets in when the suppression is first marked. The patient now begins to feel a sense of perfect nervous repose, provided there have been no lesions at the base of the brain preceding the suppression. The time at which suppression is generally manifested is the third day, though in some instances albuminous urine is passed at the very beginning of the attack, followed immediately by infarction, and, consequently suppression. In Memphis, this pathological condition was by far the most prominent feature in the

disease—so much so, that patients would frequently demand the repeated introduction of the catheter to determine whether or not suppression had set in, and we could never fail to discover the mental depression which followed upon any failure to draw urine.

On the third day, in most cases, there seems to be a point at which the disease decides which pathological direction it will take—whether to play upon the organs of urination, those of digestion, or the great nervous centers at the base of the brain.

Frequently, after the stage of pyrexia, if I may so call it, which lasts for nearly three days, the pulse drops while the temperature remains the same. This is always an alarming symptom, though the alluring sensations which this pathological relation induces in the patient are likely to lead the inexperienced observer to hope that the case will terminate rapidly and favorably. But not so; it is much easier to bring down a pulse than to bring it up; to diminish vitality than to build it up; and when once the system takes on the retrograde metamorphosis of this terrible disease, the descent is rapid, and the issue almost inevitably fatal. Yet it is here that the delusive hope is strongest in the patient's mind, and I have remarked that the more positive the evidences of dissolution the more hopeful does the patient feel. Nor is this the case only with those who are not acquainted with this peculiar fact in the Clinical History of Yellow Fever. Often have I discussed it with my co-laborers during the late epidemic, many of whom when stricken, would most strenuously insist that they were recovering when the death-damp had already gathered upon their brows.

So long as the pulse and the temperature run *pari passu*, the issue is likely to be a favorable one, and just in proportion to the discrepancy between the pulse and

thermal range are the chances for recovery doubtful. This is often very rapid. I have known the pulse to jump from 128° to 60° in six hours. Such a case is necessarily fatal. Generally, however, on leaving a patient at night with a pulse and temperature running even, I have found on the next morning the temperature but little altered, and the pulse steadily descending. In these cases, while the prognosis is unfavorable, an opportunity is afforded by judicious stimulation to bring up the pulse, while the heat of the body is reduced by means I shall hereafter describe.

The discoloration of the skin begins generally on the third day; frequently later; and in some instances does not take place until dissolution has set in. At first, the face and neck are very red, and the change to the peculiar yellow begins just behind the ears. Being due to the exudation of biliary coloring matter, it occurs after the capillaries have become congested, thus producing the red color which marks this stage of the fever. The time at which the yellowish tinge is assumed is a very good indication of the progress of tissue metamorphosis. If it is late in coming on, it indicates a high degree of inflammatory action, which drives the blood through the capillaries and prevents the exudation of biliverdine from their walls, and consequent infiltration into the surrounding tissues. My experience is, that the prognosis is decidedly more favorable when the red of congestion yields early to the yellow of exudation.

When the digestive organs are the chosen seat of pathological action in Yellow Fever, the symptoms are very distressing. This arises from the fact that they are not as they might seem, directly affected, but depend for their pathological expression upon the irritation of the Pneumogastric nerve—the sympathetic plexuses in the abdomen keeping up violent reverse peristaltic action,

and allowing nothing to be introduced either by way of alimentation or Medication.

The *black vomit* generally occurs toward the close of the fourth day; frequently earlier. It is preceded by retching, hiccough, twitching of the muscles of the lips, and a decidedly Hippocratic face. These premonitions, however, are not always so pronounced, and the attendants frequently receive the whole contents of the stomach at one gush in their faces and upon their clothes. I remember upon one occasion being saved from a baptism of black vomit by my venerable friend and co-laborer, Prof. Dowell, of Galveston, who, as I was leaning intently over a patient, seized me suddenly by the arm and drew me back from the bed just a moment before the ejection was made almost to the top of the musquito bar. In this instance, there was only a slight retching, and nothing further to indicate such a sudden, powerful, and tremendous contraction of the gastric walls. Often there appears to be no effort at ejection whatever. There is generally but little nausea, and the whole process appears to be more of a mechanical than a physiological nature.

The amount of the ejection varies greatly. In some instances it amounts to only a few stringy flocculi floating in the liquids which have been introduced into the stomach, or in the fermenting gastric juice which oozes or runs from the mouth. Often, however, the stomach is filled with it. I have seen as much as a quart ejected in the space of an hour, and I have already in the Chapter upon Pathology spoken of a case dying just before the ejection would have been made, which showed the stomach, on autopsy, to be greatly distended with black vomit.

Immediately after the ejection the patient is livid about the lips—there is a sardonic contraction of the upper

lip—a glaring look from the eyes; in a word, the most intense expression of co-mingled disgust and despair. He generally appreciates the gravity of the symptoms, and sullenly yields to his fate, which is popularly believed to be inevitable death. This, however, is not true. During our late epidemic I made the following observations:

Out of four hundred and eighty-two cases seen, I have in my note-book recorded two hundred and thirty-seven deaths preceded by black vomit. This includes all cases in which there was even the smallest quantity of the ejection. Of the cases which recovered I have noted thirty-nine who had black vomit, some of them marked "*copious*." Of these, twenty-eight were children, whose ignorance of the gravity of the symptom protected them from its depressing effect upon the mind. This shows that black vomit is by no means a necessarily fatal symptom, and that the popular idea that it is, tends greatly to depress the mind of the patient, and diminish the chances of recovery.

The ejection of the black vomit is generally attended by intense thirst, and acidulated drinks are preferred. After all vomiting has ceased, the patient frequently craves outre articles of food—such as even a healthy stomach can with difficulty digest. Often he will resort to stratagem to procure the things that he craves, and will carefully conceal the fact from the physician and attendants. If the case is going to result fatally this craving will soon be followed by the anorexia which characterized the onset of the disease; if favorable, it will increase from day to day, until it becomes almost intolerable.

The time which elapses between the ejection of the black vomit and death, if it occurs, is generally short, for, from the pathology of this symptom, we have seen

that it is the evidence of disorganization and arrest of all nutritive functions. Many patients fall back and die immediately after the ejection; while others begin at once to sink, and pass off in a few hours.

THE TONGUE.

At the beginning of the disease, the tongue is quite moist, very red at the tip and on the sides, and covered with a yellowish-white fur. It quivers very much like the typhoid tongue. From day to day the character of the tongue is changed. Frequently in twenty-four hours after the beginning of the attack, it is perfectly clean and of an intense crimson hue. Its circumvallate papillæ are thrown up in bold relief. In fact, I have never seen in any other fever this peculiar appearance brought out as it is in Yellow Fever. The circumference appears to be everted and the center projected upwards. Where the disease is of an intense grade the tongue soon becomes pointed and elongated, and resembles the tongue of typhoid fever in almost every respect. The fur appears at first white, and then turns yellowish. It is easily detached from the tongue, but readily returns. Throughout the whole course of the fever the patient complains of a bad taste in his mouth, and nothing appears to remove it.

THE ODOR

of the skin in Yellow Fever has already been referred to. It is frequently observable, even before the attack has been fully established. Generally, it is manifest in about six hours after the chill or rigor which ushers in the fever. It permeates the bedclothing and fills the whole room. The patient himself perceives it. On the third day it is most marked, and continues even through convalescence. This odor occurs in no other disease, and I

regard it as distinctively pathognomonic of Yellow Fever, though most authors simply notice the fact of its existence, without laying any stress upon its diagnostic value.

I now propose to arrange in order for ready reference the symptomatology of the disease, with direct regard to its differential diagnosis.

There is but one disease with which it is possible to confound the Specific Yellow Fever, and that is the so-called *Pernicious Malarial Fever*. That this should be so is natural, since the two diseases, especially in the late epidemic, are so intimately blended in the system. And yet, through all the shading of the symptoms, there is a distinct line of demarcation between the two, which, however delicately drawn, close observation will always disclose.

DIAGNOSIS.

Yellow Fever in its original purity is not likely to be confounded with any other disease; but of late years, in the process of assimilation, if I may so call it, which goes on in the history of every disease that is originally imported, the symptomatology has been materially modified. The same law which governs vegetable and animal life is applicable also to disease. From year to year diseases which were imported in their purity take on the livery of the country to which they have been carried, until they become to all intents and purposes indigenous. Now, this is very remarkably manifested in Yellow Fever. Formerly, there was no difficulty in diagnosing a case, but of late it has been so continuously under the modifying influence of our Malarial Fever of the Mississippi Valley, that, like the original typhoid, it has become difficult, in many instances, to discriminate between them, especially before the epidemic character

of the disease has been established. I shall give, however, below a comparative table, by which the various shadings of the two fevers as they are expressed, even at once in the organism, may be determined.

YELLOW FEVER.

PERIOD OF INCUBATION

Generally from five to nine days; some cases reported as long as twenty-seven days, but not well authenticated. Epidemic of 1878 showed the average to be five days.

USHERED IN

by a chill—often not well defined—sometimes only a slight rigor; with intense pains or uneasiness in the head, back, and loins, frequently extending to the limbs. The paroxysm does not return.

THE STOMACH.

Generally irritable. Nausea frequently severe; vomiting distressing; Epigastric tenderness marked from the beginning.

THE EXPRESSION.

The eye watery, highly injected, and restless. Countenance anxious.

TONGUE.

In the pure Yellow Fever the tongue is clean, or but slightly coated; but in proportion as the disease assumes the malarial livery does the tongue become heavily coated and furred. Towards the last becoming pointed and very red.

MALARIAL FEVER.

PERIOD OF INCUBATION

Not definite—the poison being generally diffused, and only awaiting certain conditions of the organism to express itself. It may lie in the system for months, when a change of condition and circumstances will DEVELOP it.

USHERED IN

by a decided chill and general *malaise*, which returns periodically, and continues until antidoted by remedies. Headache or fulness in the head; seldom pain in the legs or loins. Uneasiness generally confined to the vertebral column.

THE STOMACH.

In the beginning not so marked. Epigastric tenderness not so decided. Nausea and vomiting not so severe. Vomiting of bile and the contents of the stomach.

THE EXPRESSION.

The eye dull, but not remarkably changed. Countenance languid.

TONGUE.

Heavily coated throughout. Becomes thickened instead of pointed.

YELLOW FEVER.

PULSE.

Variable. At first runs very high, becoming slower toward the last. But slight, if any, remission. When noticed, generally occurring in the morning.

TEMPERATURE.

Very high from the beginning. Remission seldom marked—like the pulse—generally occurring in the morning. Continues high while the perspiration is pouring from the body.

THE MIND

generally clear. Delirium does not occur until towards the close of the disease. Patient hopeful.

URINE.

Scanty; albuminous; frequent suppression from infarction of the kidney tubes.

PROSTRATION

rare; the muscular system least affected.

HEMORRHAGES

frequent; from gums, nose, pharynx, and stomach.

DURATION.

short; generally from three to seven days. Convalescence generally rapid.

PROGNOSIS.

Decidedly unfavorable. Death rate very high, and treatment unsatisfactory.

SEQUELÆ.

Generally followed by no unpleasant effects upon the organism; in some instances, however, affecting the nervous system for many months.

MALARIAL FEVER.

PULSE.

Not so variable. Quick until convalescence sets in, but remitting with the intervals of the paroxysms.

TEMPERATURE.

Purely paroxysmal; falls when the sweating stage begins, to return with the next paroxysm. Not generally so high as in Yellow Fever.

THE MIND

always dull. Delirium frequent, even in the first paroxysm. Patient irritable and despondent.

URINE.

No albumen; highly colored but not scanty; suppression rare.

PROSTRATION

great; general indisposition to exertion.

HEMORRHAGES.

No tendency to hemorrhage.

DURATION

long; unless antidoted, lasting for months. Convalescence tedious.

PROGNOSIS.

Slight mortality; very amenable to treatment.

SEQUELÆ.

Very tedious; general debility, anorexia, and restlessness.

YELLOW FEVER.

SUBSEQUENT IMMUNITY.

Not decided. One attack renders a second attack less liable. Of late years the malarial livery has diminished the degree of immunity which formerly characterized the disease.

PHYSICAL CHARACTER.

Epidemic; disappears with frost; formerly an exotic; rapidly becoming indigenous.

MALARIAL FEVER.

SUBSEQUENT IMMUNITY.

One attack generally predisposes to another.

PHYSICAL CHARACTER.

Endemic; may occur all through the winter; originally indigenous.

THE TERMINATION

of the fever in either death or convalescence is, as we have stated, rapid. Upon the fourth day the pathological direction of the disease may generally be determined. If death is going to ensue the mind becomes wandering, though the attention of the patient can be arrested by direct address. The death is generally easy, when the nerve centers have been the battleground of the disease. When this is the case, there is violent delirium, but the patient is not conscious of suffering.

Most of the deaths were from suppression of urine, and the immediate occasion of dissolution appeared to be a dropping of the pulse, while the temperature remained the same. When death follows close upon the black vomit the patient sinks exhausted into a state of coma, from which he never arouses. The yellow color of the skin becomes more and more intense as dissolution approaches, and well suggests the propriety of the name by which this formidable malady is known.

The convalescence from Yellow Fever differs from that which follows the course of any other disease. It is very deceptive. The patient becomes anxious to get out, to eat everything within his reach, and men

of intelligence especially, are most difficult to control, for they cannot believe themselves to be in danger, and yet I have known a relapse to occur from simply sitting up in bed and reading the newspaper. Relapses are very frequent, and occur always from imprudence on the part of the patient, or too great leniency on the part of the physician.

During convalescence the pulse often remains at 60° for several weeks, showing the terrible shock to the vaso-motor nerves during the course of the fever. It is frequently very difficult to bring it up, and any extraordinary exertion or imprudence in eating may throw the system into a state of collapse from which it is most difficult to recover.

THE DEATH RATE

of Yellow Fever is for various reasons very difficult to determine accurately. During an epidemic such as that of 1878, very many cases are not reported. I enjoyed an excellent opportunity at Memphis to observe this fact, being almost daily in the rooms of the Board of Health, and though that body used every exertion to obtain accurate reports, the physicians, in most instances, neglected it, and in others, absolutely refused to do so, even when threatened with the penalties of the law. As far as I could gather, however, the death rate was about 1 to 4 in Memphis. It was greater in Grenada and Martin, and less in the other places visited by the epidemic. There seemed to be but little difference between the higher and lower classes of society, or in the various localities of the city, when once the fever had taken hold.

THE SEQUELÆ

of Yellow Fever are very variable. They were formerly not worthy of mention, and when the fever had passed off and convalescence set in, the patient was popularly considered as really improved by having the fever. But this is not so in this mixed manifestation of poisons within the system. I should say *hybrid* fever, if I did not reject the idea of any *transmutation of species*, so to speak, in disease; but certain it is, that while the malarial poison has possession of the Sympathetic, and the Yellow Fever poison runs riot through the Cerebro-Spinal System of nerves, we cannot but expect Sequelæ of a most pronounced pathological character. It is the nervous system which is most affected. There is dulness, apathy, indisposition to exertion, general *malaise*—in short, to speak popularly, the patient feels absolutely of *no account*. This often lasts for months, and the system does not seem to respond to tonic treatment of any sort. The urinary organs are often affected. Spasmodic strictures have been noted, and a general scantiness of urine, with frequent straining at micturition. The intestinal canal appears least affected, and beyond the mere indisposition to eat, the gastric functions do not retain any pathological marks of the fever. Hemorrhages from the nose, gums, and urinary organs frequently occur for some weeks after an attack.

It is to be noted that these Sequelæ are by no means constant. They frequently are entirely absent; but as far as my observation goes, they are met far oftener than formerly, and I firmly believe that this is largely due to the malarial complications which aggravate and

intensify the symptoms of the pure Yellow Fever, or, perhaps, create them, these ravages upon the organism being protected from interference by the poison of Yellow Fever, which holds the Cerebro-Spinal resistance at bay.

CHAPTER IV.

TREATMENT AND PROPHYLAXIS.

THE treatment of Yellow Fever has hitherto been entirely empirical. Opposite therapeutic lines have been followed with like failure, and with the same apparent success. Remedy after remedy has been suggested and applied; but everything proceeding upon the specific antagonism of the Yellow Fever poison has most signally failed. It is only when the symptoms are met, one by one, as they arise, that we have ever been able to combat successfully the ravages of the disease upon the organism. In Malarial Fever we have a physiological antidote in quinine; but when the Yellow Fever poison is diffused through the system, even this will fail to produce that antagonizing physiological effect by which the malarial symptoms in their purity are usually modified or subdued. I have already spoken of the fact that the Cerebro-Spinal System is the great field of operation for Yellow Fever, and it is well known that the Sympathetic sustains the same relation to the ordinary Malarial Fever. Therefore, when, as we had it in the last epidemic, both poisons exist in the body at the same time, quinine cannot reach the malarial poison on account of the previous occupation of the Cerebro-Spinal System by the poison of Yellow Fever. This introduces us at once to a most important therapeutic indication. The presence of prominent malarial symptoms would delusively suggest the use of quinine to combat them; but in the experience of most of my professional brethren

ren, it was found to be not only not beneficial in its effects, but utterly disastrous. Some of us, loth to give up the use of a remedy so long the sheet-anchor of the profession in all manifestations of malaria, persisted in it until our increasing death rate and the most apparent and positive deleterious effects under its administration forced us to abandon it. As a tonic in the convalescent stage of the fever it did well; but as a malarial antidote it utterly failed.

I have thought these observations upon the use of quinine in this fever of such prime importance as to serve well as an introduction to the therapeutic suggestions which follow.

I do not propose to recount the various lines of treatment which have been enthusiastically endorsed and pursued by the profession in this disease, but simply to record what my own experience and observation has demonstrated to be most successful in controlling the symptoms as they arise in the course of this formidable malady.

When the rigor or chill which ushers in the disease comes on the patient should be put to bed at once, and blankets supplied. The feet should be plunged into a hot mustard bath *underneath the bedclothes*. The water should be renewed in ten minutes, and not allowed to cool. It should be as hot as the patient can bear. This bath should last at least fifteen minutes. A mustard plaster five inches broad should be applied to the whole length of the spine from the occiput to the end of the sacrum. The mustard should be covered with *gauze*, not linen or cotton. This should remain at least half an hour, and longer if the patient can bear it. During all this time he should be enveloped in blankets, and the temperature of the room not allowed to go below 75° Fahr. Three tablespoonsful of castor oil should

now be administered, and the patient kept quiet for six hours, with iced lemonade placed beside him, of which he may partake *ad libitum*. If the stomach rejects the oil it should be administered by the rectum. Cold clothes should be applied to the head, or what is better, when they can be obtained, ice bladders. These should be kept there, and as the fever rises they should extend along the course of the carotids on the neck. After the oil operates the following prescription should be administered, to guard against renal infarction, and consequent suppression early in the action.

R

Ammoniæ Phosphatis,	} aa
Sodæ Hyposulphiti,	
Aquæ Aurantii florum,	
	3iij
	3vj

M.

S. Tablespoonful every four hours.

This will fulfil two indications ; first, it will prevent by the phosphate of ammonia the solution of the albumen of the blood, and its consequent exosmosis into the tubes of the kidney ; second, it will arrest fermentation in the blood by the hyposulphite of soda, thus preventing carbonic acid from being set free, and the consequent solution of the albumen. It acts also as a diuretic, and assists in elimination, which is the great end to be attained in the treatment of Yellow Fever.

For the first day the patient should be allowed nothing to eat or drink but lemonade. He may use brandy freely, but not champagne or fermenting drinks, as they are apt to acidify the stomach and set up gastric irritability. With these directions, we may generally wait twelve hours without further interference.

The patient should not be allowed to raise his head from the pillow. The bed-pan is to be used, and drinks

are to be administered through the funnel cup, with both of which named articles the drug stores should be provided during an epidemic. *This is absolutely essential.* In no disease is attention to details such as these so important as in Yellow Fever. There should be no one allowed in the room but the physician and the nurse. The light should be subdued, and there should be perfect quiet. The air of the room should be fumigated with sulphur and chlorate of potash pastiles, and the bedclothing of the patient sprinkled with cologne water. Such directions may appear trivial, but the physician who attends to these apparently trifling details will be amply rewarded in observing the effect upon the patient. Any sort of excitement—pleasurable or otherwise—is detrimental. All conversation should be forbidden, and the nurses should be charged with this most emphatically, both as regards themselves and others.

If gastric irritability should arise the following prescription should be resorted to. In fact, it should be kept constantly in the room to be used promptly:

R	
Creosoti,	gtt. xx
Morphiæ Sulphatis,	gr. j
Sp. Vini Gallici,	ʒij

M.

S. Teaspoonful at intervals not shorter than one hour.

If restlessness and jactitation should require interference the best hypnotic will be found in the following:

R	
Potassii Bromidi,	ʒvj
Chloral. Hydr.,	ʒi
Aq. dest.,	ʒiij

M.

S. Teaspoonful as indicated.

It will not do to administer morphine or opium in any form to the extent of hypnotism, as it produces a hyperæmic condition of the brain, which is a pathological condition to be avoided.

If, after the use of the phosphate of ammonia and hyposulphite of soda, suppression should occur, efforts must be made to drive the urine through the tubes of the kidney, and with it the impacted albumen. For this purpose watermelon-seed tea seemed to be the favorite agent; but in my hands and under my observation, I have found no diuretic to succeed in emptying the blood of urine, since the obstruction is a mechanical one. In a few instances, I have known diuresis to occur after the use of large doses of oil of turpentine poured upon sugar, and administered constantly to the patient; but the number of instances in which the suppression was relieved by this method was not sufficient to establish it as a positive therapeutic agent in this condition. Buchu is worthless, and, in fact, all the ordinary diuretics signally fail to produce any effect. Flannels steeped in hot water and placed over the kidneys sometimes relax and open the tubes, so that by a powerful diuretic stimulant they may be emptied; but very seldom does this occur, and there is but little hope for the patient when the urine shows the presence of albumen, and suppression has taken place. I look upon this pathological condition as utterly beyond the reach of therapeutics, and I have never felt so helpless as when brought face to face with this peculiar pathological factor in the disease. However, we must do something, and the only hope is dilatation of the tubes and stimulation of the excretory functions. It is for this reason that I so earnestly urge the use of the formula, which I have given for the prevention of this formidable pathological condition.

After the first day the patient may be allowed a little beef-tea and the yellow of a hard boiled egg, chopped up very fine. During the first of the late epidemic large shipments of champagne were made to Memphis, and were at once taken up by the physicians and freely and indiscriminately used among the patients. So evil was the effect produced that some of us publicly implored the good people throughout the Union to desist from sending it. Nothing but brandy or good whiskey will do as a stimulant in Yellow Fever. I think in this, the most experienced will bear me out. These may be used freely—of course not to the point of intoxication. The pulse does not appear to be quickened by them, and the perspiration is decidedly freer; so also the excretion of urine.

From this time on until the fever breaks, our object must be to cool down the system. Use ice freely externally and internally. I have kept the head packed in ice bladders for days without intermission, and always with good effect.

Sponging with whiskey and water produces often a wonderful effect. It will control the fever effectually when all else has failed. When it is properly done, it is in my opinion the most satisfactory remedial agent that can be employed. It should be done under the bedclothes, and after the body has been wiped dry the patient should be well covered and protected from draught. These spongings should be repeated every half hour while the fever is raging. If I dared to do so, I should recommend the German treatment of keeping the patient under water kept a fixed temperature for several days.

I doubt not that it would diminish the mortality of Yellow Fever; but, as in the old fable, though we all agree that it is rational and ought to be done, not a

mouse is to be found who will bell the cat. Certain it is that the most satisfactory results were obtained by the use of water freely. A Russian bath would be the very thing, if it were practicable, and I am resolved to have one conveniently erected for constant use in the next epidemic which shall visit us. Here we have a pyrexia—in common parlance *inward fire*, and outward too, for that matter. Water and ice will cool it, and cool it effectually. The wet pack is a very rational line of treatment. I only saw it applied in one instance, and that successfully. The fact is, we have all been too timid in applying our philosophy of treatment.

With what breathless anxiety did we await the result of Dr. CHOPPIN'S sprinkling treatment with his patient in New Orleans, and not a man of us had the courage to carry it out, though I have yet the first one to meet who does not endorse it as rational. Water is the remedy in Yellow Fever.

In regard to the diet of the patient as the fever progresses, I know of nothing more grateful or harmless than good fresh buttermilk. It should be iced, and the patient may take it whenever he chooses.

After the second day, unless the symptoms imperatively demand interference, all medication should be stopped,—lemonade, buttermilk, and a little brandy, with frequent sponging, furnishing the best line of treatment. There will, however, be likely to arise obstinate constipation, which is best relieved by freshly prepared Citrate of Magnesia; and, if that does not operate, an enema of castor oil and Castile soap should be resorted to.

Whenever black vomit is threatened the creosote and morphia mixture should be promptly used, and in order to restore the tone of the stomach, and also to prevent

or check hemorrhage, I have found the following an excellent formula:

R

Tinct. Cinchonæ,	} aa	
“ Calumbæ,		} ʒiiss
“ Ferri Muriat.,		ʒj

M.

S. Teaspoonful every four hours.

This is to be used where the retching is violent, or when hemorrhages are threatened or occur. Along with this, pounded ice should be always kept by the bedside, and the patient allowed to partake of it freely.

If the pulse and the temperature should keep up notwithstanding the sponging and cold applications, Tincture of Aconite may be used with caution, say beginning with three drops every half hour, and increasing it gradually according to circumstances, in the course of twelve hours, or until there is some marked impression made. Very great care is needed here, for, as we have said, it is much easier for us to bring down a pulse than to bring it up, and if the temperature remains the same, then everything which depresses the circulatory system is contraindicated, and stimulants should be at once resorted to.

In regard to Calomel, I am free to say that my experience is decidedly adverse to its use, except in very minute doses. During the pyrexia, when the liver and secretory apparatus generally was threatened with engorgement, I have seen $\frac{1}{24}$ of a grain of Calomel administered every hour prove greatly beneficial, putting the whole alimentary canal under the stimulus of healthy bile, and, in fact, opening up generally the channels of the system.

As an eliminator Iodide of Potassium frequently will

favorably turn the tide of the disease, but great care must be observed with regard to the time and quantity of its administration. It should never be used when the stomach is irritable, and in larger doses than five grains, which may be repeated every half hour until the effects are observed.

In regard to the various remedies that have been used for the first time in this fever during the late epidemic, I have nothing to say, except one which was much vaunted as a diuretic. I speak of *Jaborandi*. Scarcely a paper failed to contain some recommendation of this remedy, but I have failed to see the slightest good effect from its use; nor do I believe that its administration to this end is at all rational or scientific, for reasons already suggested.

What I have already given covers the medication necessary in Yellow Fever. As far as possible the use of drugs should be avoided. Nursing—careful, anxious, incessant nursing—is the Hamlet of the play in Yellow Fever. Water, ice, lemonade, buttermilk and prudence,—these furnish the basis of therapeutic action in this disease.

During convalescence the patient should be most carefully watched, as he will most certainly act with imprudence if allowed to do so. The diet should be very light—for the most part broth. A dried herring—broiled on the coals—may be eaten daily; in fact, I have known this little fish to quiet the stomach when black vomit was threatened, and nothing else seemed of any avail. The idea was first suggested to me at sea, where, in most instances, I found it an effectual antidote to sea-sickness.

Quinine may be used in tonic doses with good effect during convalescence. I know of no better tonic, however, during the convalescent stage of Yellow Fever than Caswell, Hazard & Co.'s Ferro Phosphorated Elixir

of Calisaya. It is grateful, assimilable, and invigorating.

If the patient is an habitual smoker, he may smoke moderately during convalescence, and it often appears to have a fine effect upon the nervous system.

The use of ale or beer, when agreeable to the taste of the patient, may be entered upon early in convalescence. All oily or greasy substances should be avoided; so also sugars of every sort.

Particular attention must be paid to the temperature of the room. It should be kept equable and entirely free from draughts. The mind of the patient should, as far as possible, be kept quiet and free from anxiety, care, and excitement.

PROPHYLAXIS.

There are two standpoints from which to view this branch of our subject; First, as to individuals; Second, as to communities.

As to the individual it might be expected that my observations must be brief.

It has for many years been supposed that one attack of Yellow Fever imparts to the system immunity from another. My venerable friend, Prof. DOWELL, of Galveston, still strongly adheres to this belief. But, while I am ready to accept this as a fact in the history of the disease, as manifested in its former purity, I cannot but think that the experiences of the last epidemic go to show that malarial influences have so modified the manifestation of the Yellow Fever poison, as to diminish in a large degree the protection afforded by previous inoculation.

Very many persons died of Yellow Fever in 1878, who had come through violent attacks in 1873, and, in-

deed, so marked was this fact, that the inhabitants ceased to rely upon the immunity supposed formerly to be enjoyed by those who, during previous epidemics, had yielded to the poison.

As to any protective agents, I know of none that may be used as specific prophylactics, and yet there are steps which may be taken, and which I shall enumerate, that may serve to strengthen the powers of resistance in the organism, or at least very much modify the attack if it should occur.

The bowels should be kept regular, and if there is constitutional predisposition to constipation, they should be kept a little loose by the use of Seltzer Water, or some other mild saline laxative. Lager Beer should be used freely every day in quantities sufficient to act freely upon the kidneys. The diet should be light and nutritious, avoiding all heavy meats, pastry and sugars. Phosphate of Ammonia and Hyposulphite of Soda (see Formula, page 59) should be taken once a day to prevent the development of microzymes in the blood. If this, however, becomes disagreeable to the stomach, it should be discontinued. The skin should be kept active all the time. For this purpose small portable vapor baths should be procured and used by one exposed to the infection every night before retiring, taking care to rub the person dry afterwards. Frequent ablutions are beneficial. The mind should be kept free from anxiety. No person who fears the fever should remain within range of its infection, if it is possible for him to get off. Likewise all recklessness should be avoided, and a perfect equanimity diligently cultivated.

Quinine, as an antiloimic agent, is utterly worthless, and, I believe, most positively harmful.

No eruptions upon the skin should be checked. A gonorrheal flow should be allowed to take its course.

Venereal indulgence should be limited. It more than all else puts the system in a proper trim for the fever. Flannel should be worn next the skin, and changed twice a week. Night air should be avoided as much as possible. The bed should be rolled in the middle of the room, and the whole house should be ventilated through the day and closed at night.

Sulphur should be burned and powder exploded in every room at least once a day—better in the afternoon.

Exercise should be taken daily, but it should be neither violent nor protracted. Exposure to the sun should be avoided as much as possible.

Smoking, when in the sickroom, has been proven to be to some extent prophylactic.

A certain amount of sleep is required—six hours at the very least—and there must be no extra exertion or overwork. This, I regard especially, as an important injunction, since those who remain during an epidemic, generally, in their efforts to serve others lose all thought of themselves, and sink with prostration in the midst of the excitement and enthusiasm which surrounds them.

But the best of all prophylactics is to remove from the infected districts. This is not only expedient, but it is the bounden duty of every one who is not rendering actual service to the sick and needy.

As to communities, the question of prophylaxis has two aspects—*internal* and *external* protection.

But little benefit seems to have been derived from the use of fires built along the streets. There were large quantities of sulphur consumed in Memphis. At night the very air was laden with the fumes, yet it did not appear to have any effect whatever in checking the ravages of the pestilence. It was, however, a source of comfort, and of a certain degree of satisfaction to those who saw it, to know that efforts of some sort were being

made to stay the hand of the destroyer, and especially upon the minds of the lower classes was this effect produced.

In the summer of 1877, at the meeting of the American Association for the Advancement of Science, a paper was presented and read by Mrs. Ingram of Nashville, upon the destruction of germs in the air by concussion, illustrated by the killing of mosquitoes in a room by the explosion of a small quantity of gunpowder. During the epidemic I received several letters from this lady urging the firing of cannon throughout the city. Others also favored the trial, but it was utterly as impracticable, as it was impossible, in times like those, to obtain gunners, and to carry out to any practical extent the application of the theory. I have no doubt, however, that it might prove of considerable value if it could be practically carried out.

The disinfection of localities is a matter of time. It cannot be done after the epidemic has set in, and, in fact, Yellow Fever does not seem to like one place any better than another, and I have often thought that if there was any difference the most cleanly portions of the city suffered most the ravages of the fever; and yet it cannot be denied that proper hygienic surroundings are in general better likely to place the system on a higher ground of resistance than the opposite condition.

For the protection of communities visited by Yellow Fever, I know of no grander nor more successful scheme than that originated and carried out by Gen. LUKE E. WRIGHT and the late CHARLES G. FISHER, of the Citizens Relief Committee at Memphis.

Several miles outside of the city a large camp was organized under military discipline. Col. JNO. CAMERON was placed in charge. His gallant company, the Bluff City Greys, and a finely organized colored company un-

der command of Capt. JAS. GLASS, performed guard duty during the whole of the epidemic. Tents were forwarded by the Government, and nearly a thousand persons were at times accommodated in the camp. A regular Quartermaster and Commissary Department was organized, and rations daily furnished. A hospital was erected, and all persons coming into camp with the fever in them, or on them, were sent thither, and attended by a regularly appointed surgeon—Dr. R. B. NALL, of Memphis. No person was allowed to enter or leave camp without a permit, and everything was furnished from the city by a special train leaving daily for the camp and returning.

In this way the fever was kept from spreading, and the camp throughout the whole course of the epidemic enjoyed unusual health for that season of the year.

This system of depopulation proved such a brilliant success that I have thought it worthy of special and detailed notice. It should be adopted promptly at the very beginning of the epidemic, and martial law called in requisition if necessary to enforce its acceptance by the people. It is effectual, practicable, economical, and expeditious.

And now as to the *external* aspect of prophylaxis as applied to communities.

This brings us face to face with the *questio vexata* of Quarantine. In the Chapter on Etiology, I have already intimated that the idea of a general quarantine is utterly preposterous. In the *first* place, it proceeds upon a false basis of Etiology. I have shown that while Yellow Fever may have originally been an imported disease—an exotic—it is now no longer so. 'Just as some plants, which, when originally brought to our latitude required the protection of hot-houses and tender nursing, but now grow wild in our woods; so has Yellow Fever become modified by the changed external conditions to which for

years it has been subjected, and adapted to its surroundings by those immutable laws of assimilation and selection which govern all life from the protozoa to the vertebrates; and in this modified manifestation it is indigenous.

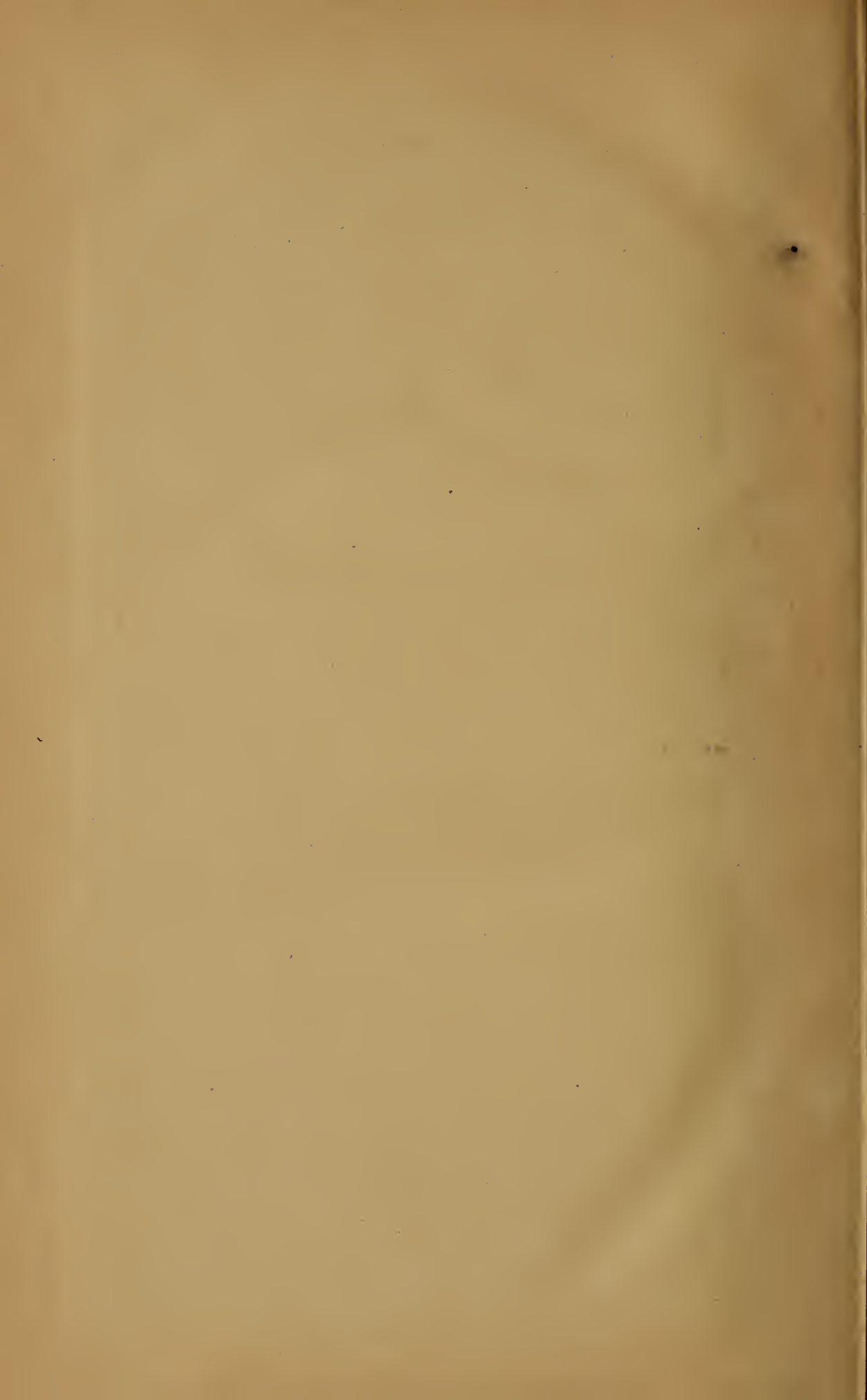
But the advocates of quarantine triumphantly assert that some of the smaller towns along the lines of travel, where quarantine was rigidly enforced were not visited by the epidemic, and this is offered as a conclusive argument in its favor. But this proves nothing; for in the neighborhood of those towns were others where the quarantine was not enforced, and where not a single case of fever occurred, except what was imported. For example, the town of McKenzie, fairly interlaced by the channels of the epidemic, with free entry and exit, two main railroad trunks crossing it, and coming in every direction from the infected districts, and yet not a single case of indigenous fever. Can the supporters of the quarantine say whether the small towns which they cite enjoyed their immunity from natural causes or from the efficiency of quarantine? I think not.

And again, quarantine can never be perfect, and is therefore impracticable. It would require a cordon of ships from the Bay of Fundy to the Gulf of California, so close together as to touch each other, in order effectually to carry out to perfection the prophylaxis of quarantine. One case is sufficient to infect a continent, and if a ship is out at sea with Yellow Fever aboard, my own experience is, that she will land somewhere despite all precautions and restrictions. It is therefore impracticable.

It is, besides, most lamentably destructive to commerce, and damaging to all the interests of a country; besides in itself being a source of unlimited expense.

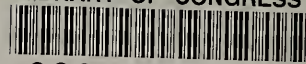
I can, therefore, do nothing in any way to encourage

the establishment of a National Quarantine. The battleground is not here. We cannot keep from our shores that which has already become acclimated and indigenous to the interior of our land. We must recognize in this fearful malady an internecine foe, dangerous and deadly. It belongs to us to meet it within our borders, and I doubt not that the day will soon come when, as in those countries where Yellow Fever had its birth, it will no longer be the terror of our people, nor hang like a pall over all our social and commercial interests.





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